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Fuzzy dark matter constraints using a single VLBI observation of a gravitationally lensed radio jet

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Strong gravitational lensing by galaxies provides us with a powerful laboratory for testing dark matter models. Various particle models for dark matter give rise to different small-scale distributions of mass in the lens galaxy, which can be differentiated if the observation is sensitive enough. The sensitivity of a gravitational lens observation to the presence (or absence) of low-mass dark structures in the lens galaxy is determined mainly by the angular resolution of the instrument and the spatial structure of the lensed source.

In this talk, I will present results from the analysis of a global VLBI observation of a gravitationally lensed radio jet. With an angular resolution better than 5 milli-arcseconds and a highly extended, spatially resolved source, we are able to place competitive constraints on the particle mass in fuzzy dark matter models using this single observation. I will also present preliminary results from our analysis of warm dark matter models using this lens system. Our results illustrate the key role that VLBI observations will play in revealing the nature of dark matter, especially in light of the ˜10ˆ5 gravitational lens systems with radio-bright sources that will be discovered by the Square Kilometre Array.

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